

FORM PTO-1390

(REV. 5-93)

U.S. DEPARTMENT OF COMMERCE  
PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

10191/1234

09/446390

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)

520 Rec'd PCT/PTO 21 DEC 1999

INTERNATIONAL APPLICATION NO.  
PCT/DE99/01206INTERNATIONAL FILING DATE  
(22.04.99)  
22 April 1999PRIORITY DATE  
CLAIMED  
(23.04.98)  
23 April 1998

## TITLE OF INVENTION

ELECTRIC MACHINE HAVING A COMMUTATOR

## APPLICANT(S) FOR DO/EO/US

SCHULER, Dieter; EITEL, Christoph; KÜNZEL, Gerald, and EWERT, Andreas

Applicants herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
- a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
- b. ☒ has been transmitted by the International Bureau.
- c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
- a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
- b. ☐ have been transmitted by the International Bureau.
- c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
- d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

## Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document (executed) for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
- ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other: A copy of the PCT Search Report and PCT/RO/101.

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16. [X] The following fees are submitted:

CALCULATIONS | PTO USE ONLY

**Basic National Fee (37 CFR 1.492(a)(1)-(5)):**

Search Report has been prepared by the EPO or JPO ..... \$840.00

International preliminary examination fee paid to USPTO (37 CFR 1.482) . \$670.00

No international preliminary examination fee paid to USPTO (37 CFR 1.482) but  
international search fee paid to USPTO (37 CFR 1.445(a)(2)) ..... \$760.00Neither international preliminary examination fee (37 CFR 1.482) nor international  
search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$970.00International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims  
satisfied provisions of PCT Article 33(2)-(4) ..... \$96.00**ENTER APPROPRIATE BASIC FEE AMOUNT =** \$ 840.00Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$ 0

Claims	Number Filed	Number Extra	Rate
Total Claims	5 - 20 =	0	X \$18.00
Independent Claims	3 - 3 =	0	X \$78.00
Multiple dependent claim(s) (if applicable)			+ \$260.00

\$ 0

**TOTAL OF ABOVE CALCULATIONS =** \$ 840.00Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must  
also be filed. (Note 37 CFR 1.9, 1.27, 1.28).

\$ 0

**SUBTOTAL =** \$ 840.00Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(f)).

+

\$ 0

**TOTAL NATIONAL FEE =** \$ 840.00Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be  
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +

\$

**TOTAL FEES ENCLOSED =** \$ 840.00

\*Calculations based on Preliminary Amendment.

Amount to be:  
refunded \$  
charged \$

- a. ☐ A check in the amount of \$\_\_\_\_\_ to cover the above fees is enclosed.
- b. [X] Please charge my Deposit Account No. 11-0600 in the amount of \$840.00 to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 11-0600. A duplicate copy of this sheet is enclosed.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Richard L. Mayer, Esq.  
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SIGNATURE

DATE

Richard L. Mayer, Reg. No. 22,490

09/446390

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[10191/1234]

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant(s) : Dieter SCHULER et al.  
Serial No. : To Be Assigned  
Filed : Herewith  
For : ELECTRIC MACHINE HAVING A COMMUTATOR  
Examiner : To Be Assigned  
Art Unit : To Be Assigned

Assistant Commissioner for Patents  
Washington, D.C. 20231

**PRELIMINARY AMENDMENT**

SIR:

Kindly amend the above-identified application before examination and calculation of the filing fee as follows:

**IN THE SPECIFICATION:**

On page 1, delete lines 1 and 2 , and insert:

- -Background Information- -.

On page 1, line 3, change "German Patent 31 31 759 C2" to - -German Patent No. 31 31 759- -.

On page 2, line 14, delete "C2".

On page 2, lines 26 and 27, change "known from Unexamined German Patent" to - -described in German Patent No. - -.

On page 2, line 29, change "British Patent" to - -British Patent No. - -.

On page 3, delete lines 3 and 4 and insert:

- -Summary Of The Invention- -.

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On page 3, line 5, delete "having the characterizing features of".

On page 3, line 6, delete "Claim 1" and "also".

On page 3, lines 6 and 7, change "having the characterizing features of Claim 2" to - -according to the present invention- -.

On page 3, delete lines 25 and 26.

On page 3, line 27, change "characterized in the subordinate claims. For example, the" to - -The- -.

On page 3, line 30, change "The" to - -An- -.

On page 3, line 31, change "Claim 4" to - -the present invention- -.

On page 4, line 1, change "Claim 5 concerns" to - -The present invention also provides- -.

On page 4, delete lines 5-15, and insert:

#### - -Brief Description Of The Drawings

Figure 1 shows a longitudinal section through the electric machine having a collector and brushes.

Figure 2 shows a front view of the collector and the respective brushes.

Figure 3 shows a detail of the brushes used as an example.

#### Detailed Description- -

On page 5, line 26, change "said" to - -the- -.

On page 6, line 23, change "this" to - -the present- -.

On page 8, delete the first line, and insert::

- -What Is Claimed Is:- -.

**IN THE ABSTRACT:**

Delete lines 1-12, and insert:

- - Abstract Of The Disclosure- -.

Line 13, change "According to the present method, the" to - -A- -.

Line 14, delete "(19, 20)".

Line 15, delete "(29, 30)".

Line 16, delete "(19, 20)" and "(2)".

Line 19, delete "(29, 30)" and "(19, 20)".

Line 20, delete "(19a, 20a)".

Lines 20-22, change "faces.

By" to - -faces. By- -.

Line 24, delete "(2)".

Line 26, delete "(28)"

Line 27, delete "(27)".

Line 28, delete "(28)".

Line 29, delete "(27)".

Delete line 31.

**IN THE CLAIMS:**

Please cancel claims 1-5, without prejudice.

Please add new claims 6-10 as follows:

6. (New) An electric machine comprising:

a commutator;

at least one brush; and

a supply of oil lubricant for providing lubrication between the commutator

and the at least one brush,

wherein the at least one brush contains the lubricant at least one of: (a) in or on a collector-side end face of the at least one brush, and (b) in or on a partial length of the at least one brush beginning at the collector-side end face of the at least one brush.

7. (New) A method for manufacturing an electric machine having a commutator, at least one brush and a supply of oil lubricant, comprising the step of:

providing the at least one brush with at least some of the supply of lubricant in an area of an end face intended for contact with a collector before being installed in the electric machine.

8. (New) The method according to claim 7, further comprising the step of applying the lubricant by spraying.

9. (New) The method according to claim 7, further comprising the step of mixing the lubricant with a solvent for a spray application.

10. (New) A brush for an electric machine equipped with a collector, comprising:  
an end face; and  
a supply of lubricant in an area of the end face allocated to the collector.

### REMARKS

This Preliminary Amendment cancels, without prejudice, claims 1-5 in the underlying PCT Application No. PCT/DE99/01206, and adds new claims 6-10. The new claims conform to U.S. Patent and Trademark Office rules and do not add new matter to the application.

The amendments to the specification and abstract are to conform the specification and abstract to U.S. Patent and Trademark Office rules, and do not introduce new matter into the application.

The underlying PCT Application No. PCT/DE99/01206 includes an International Search Report, dated September 21, 1999, a copy of which is included. The Search Report includes a list of documents that were considered by the Examiner in the underlying PCT application.

Applicants assert that the present invention is new, non-obvious, and useful. Prompt consideration and allowance of the claims are respectfully requested.

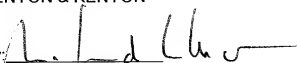
Respectfully Submitted,

KENYON & KENYON

Dated:

12/21/99

By:

  
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ELECTRIC MACHINE HAVING A COMMUTATOR

## Background of the Invention

German Patent 31 31 759 C2 describes the manufacture of an electric machine having a combination of a commutator, at least one brush that can be pressed against the commutator and a supply of oil lubricant. When the electric machine is assembled, the commutator is sprayed with an oil lubricant. In spraying, oil lubricant cannot be prevented from entering the electrically insulating grooves between the collector bars of the commutator. In operation of the electric machine, the oil lubricant on the collector bars counteracts electric arcing, also called brush sparking, and thus prevents arcing from pitting the commutator and thus causing uneven running of the electric machine. In order for the supply of lubricant to be as large as possible while also permitting adequate electric contact between the bars of the commutator and the minimum of one brush, small balls are thrown against the bars of the commutator before spraying to produce small recesses which function as storage reservoirs for the oil supply or increase the reservoirs.

A collector for such an electric machine is manufactured, for example, by injecting a thermoplastic material into an essentially tubular blank made of copper and by cutting the blank at regular intervals measured in the circumferential direction, creating grooves and bars electrically insulated from one another in the collector. These grooves also extend into the thermoplastic material. Brushes for such a collector are generally provided with grooves running in the circumferential direction of the collector on the end facing



the collector for the purpose of creating relatively high abrasion when the electric machine is initially started, so the brushes adapt to the outside contour of the collector on these end faces as rapidly as possible. A rapid run-in is desired, so that the originally small contact faces of the brushes rapidly increase in size and thus the electric amperage per unit of contact area declines. Abrasion fines from the brushes occurring during run-in as well as from the copper collector bars conduct electricity and therefore can lead to a parasitic current flowing from one collector bar to the next when this abrasion collects in the grooves between the collector bars. If the collector is sprayed with an oil lubricant according to German Patent No. 31 31 759 C2, collection and adherence of conductive abrasion fines in the slots is promoted. A high current flow due to collected abrasion fines can in principle "burn off" the collected abrasion fines and thus produce a type of thermal cleansing of the grooves. However, such high currents occur only with heavy loads on the electric machine. If such an electric machine is used as the drive for a fan in a motor vehicle, it often happens that such an electric machine is operated only at a low speed and a low amperage to minimize noise. Consequently, the possibility cannot be ruled out that the desired thermal cleaning of this type might not occur.

An example of a brush that permits a rapid run-in is known from Unexamined German Patent 28 56 112.

British Patent 1,591,349 describes how brushes are completely impregnated with an oil that is not fluid or with a wax that does not melt during operation of the engine, e.g. using a gelling agent, with the goal of extending the lubrication to the entire lifetime of the brushes. Thus, all

the abrasion fines from the brushes contain lubricant.

#### Summary of the Invention

5 The electric machine having the characterizing features of Claim 1 and also the method having the characterizing features of Claim 2 yield the advantage that an oil-free and lubricant-free collector can be installed in the electric machine, and a supply of oil lubricant can be introduced  
10 into the electric machine using at least one brush as a supply container. The goal here is to keep the supply of oil lubricant minimal but sufficient for the time of adaptation of the brush end faces to the curvature of the collector bars and for smoothing the collector bars in friction contact with the brushes. Therefore, after such run-in of a  
15 combination of collector bars and brushes, the oil lubricant held by the brushes can be used up, so that most of the lifetime of the electric machine elapses without the deleterious presence of oil lubricant when brush abrasion fines develop. The risk of the grooves between the collector  
20 bars becoming filled with conductive abrasion fines in the long run and conducting parasitic currents is thus low accordingly.

25 Alternative possibilities for carrying out the method according to Claim 2 are given through the measures characterized in the subordinate claims. For example, the oil lubricant may be sprayed onto the respective brush at the end face, with the amount being allocated to the brush  
30 being determinable by the spray time, for example. The alternative according to Claim 4 is used when the oil lubricant is comparatively viscous and the depth of penetration of this lubricant into the brush is to be

controlled. Claim 5 concerns a brush whose characterizing features ensure a lubricant supply in an electric machine having a collector.

## 5 Brief Description of the Drawings

The electric machine according to the present invention is illustrated in the drawing and described in detail below. Figure 1 shows a longitudinal section through the electric machine having a collector and brushes; Figure 2 shows a front view of the collector and the respective brushes, and Figure 3 shows a detail of the brushes used as an example.

## Detailed Description

Electric machine 2, schematically shown in Figure 1 as an example, has a first pot-type casing part 3 and a second pot-type casing part 4, permanent magnets 5, 6 accommodated in pot-type casing part 3, an armature 7 that can rotate between permanent magnets 5 and 6 and a collector 8 allocated to armature 7, a shaft 9 carrying armature 7 and the collector and connecting them to one another in a non-rotatable manner, a friction bearing 10 next to collector 8 and, at a distance from that, another friction bearing 11 next to armature 7. Friction bearing 10 is composed of a friction bearing bush 12 and a shaft segment 13 mounted in friction bearing bush 12, forming a journal-like end of shaft 9 in this embodiment. Friction bearing bush 12 is sintered according to the related art, for example, made of metal or a combination of metals and impregnated with an oil lubricant. Friction bearing bush 12 is held by a bearing plate 14 molded on casing part 4, for example. In a similar manner, another bearing plate 15, for example, is molded on

casing part 3 and also accommodates a sintered friction bearing bush 16. Another shaft segment 17 extends rotatably inside sintered bearing bush 16, so that shaft segment 17 and sintered bearing bush 16 form friction bearing 11. Shaft segment 17 has a fan wheel or fan impeller (not shown) mounted on it.

In this example, two brushes 19, 20 made either partially of carbon or mainly of a pressed metal powder or alloys according to the related art are provided for collector 8. The mechanical guidance of brushes 19 and 20 should permit their electric contacting by way of brush mounts 21 and 22. In addition, it is pointed out that three or more brushes can be assigned to collector 8 in some cases.

A dust guard 25 may be provided on shaft 9 between collector 8 and friction bearing bush 12.

According to Figure 2, collector 8 has an insulating carrying body 26 in a non-rotatable mount on shaft 9 carrying a number of bars 27 made of copper or a copper alloy. In a manner known from the related art, collector 8 may be made of an essentially tubular blank into which a thermoplastic material can be injected to form the insulating carrying body, after which individual bars 27 as shown in Figure 2 are formed from said tubular blank by the arrangement of grooves 28. Eight bars are illustrated in Figure 2 as an example. In deviation from that, the design engineer may also select a different number of bars.

Figure 2 shows end faces 29, 30 of brushes 19, 20, with these end faces 29 and 30 being directed against collector 8 for electrically conducting contact with bars 27 of this

collector 8. In the example shown here, each of two brushes 19, 20 is prepared with an oil lubricant, for example, along a partial length 19a and 20a marked graphically starting from these end faces 29 and 30. This oil lubricant, the  
5 choice of which can be left up to those skilled in the art for the combination of collector and brushes, may be sprayed or otherwise applied with or without diluting before installing brushes 19, 20 in electric machine 2. Meanwhile, those skilled in the art will have the option of selecting  
10 between several methods of applying or introducing a supply of oil lubricant suitable for the intended purpose to end faces 19, 20 of such brushes 19, 20 or through these end faces to partial lengths 19a, 20a of brushes 19, 20.

It is essentially sufficient if one of two brushes 19 or 20 is provided with a supply of oil lubricant because all collector bars 27 come in contact with the lubricant, starting from this prepared brush. If both brushes 19 and 20 are each installed and provided with a supply of lubricant, this yields the advantage that only one type of brush need be kept in stock. With each of the brushes provided with lubricant, it is also certain that any electric machine is lubricated in the sense of this invention.

Figure 3 shows another illustration of brush 20. Brush 20 here is rotated 90° in comparison with Figure 2. This makes grooves 31, which are aligned in the circumferential direction of collector 8, visible. As mentioned in the introduction to the description, these grooves 31 permit a  
25 rapid adaptation of the curvature of end faces 29 and 30 of brushes 19 and 20 to the external shape of bars 27, with the goal of rapidly creating a contact surface corresponding to the respective dimensions of brushes 19, 20 in the  
30

circumferential direction of collector 8. When such grooves 31 are cut into brushes 19, 20 before applying oil lubricant, they are also useful as storage containers for the oil lubricant.

## Patent Claims

1. An electric machine (2) having a combination of a commutator (8), at least one brush (19, 20) and a supply of oil lubricant, which provides lubrication between the commutator (8) and the minimum of one brush (19, 20), characterized in that at least one of the brushes (19 and/or 20) contains the lubricant supply in or on a collector-side end face (29, 30) or in or on a partial length (19a, 20a) of this brush (19, 20) beginning at the collector-side end face (29, 30).

2. A method of manufacturing an electric machine (2) having a commutator (8) and at least one brush (19, 20) and a supply of oil lubricant, in particular according to Claim 1, characterized in that at least one of the brushes (19, 20) has at least some of the supply of lubricant in the area of an end face (29, 30) intended for contact with the collector (8) before being installed in the electric machine (2).

3. The method according to Claim 2, characterized in that the oil lubricant is applied by spraying.

4. The method according to Claim 2, characterized in that the oil lubricant is mixed with a solvent for spray application.

5. A brush for an electric machine equipped with a collector, characterized in that the brush (19, 20) has a supply of lubricant in the area of an end face (29, 30) allocated to the collector (8).

## Abstract

Electric machines having a collector and brushes that can be pressed against it and having a supply of lubricant that is effective for preventing or reducing electric arcing between the collector and the brushes during operation of the machine and thus preventing the resulting pitting on the collector are known. Such pitting leads to uneven running of the electric machine. In the related art, the lubricant is sprayed onto the collector, or the entire length of the brushes is impregnated in vacuo.

According to the present method, the lubricant, e.g., an oil, is applied to the brushes (19, 20) only in the area of collector-side end faces (29, 30) before installing the brushes (19, 20) in the electric machine (2). The lubricant may be applied by spraying or by some other method. Application of lubricant here is limited to the end faces (29, 30) of the brushes (19, 20) or to short partial lengths (19a, 20a) thereof adjacent to the end faces.

By limiting the supply of lubricant in this way, the lubricant is used up during run-in of the electric machine (2) or not too long thereafter, with the advantage that it counteracts the risk of brush abrasion fines or collector abrasion fines collecting in grooves (28) between collector bars (27), which would be a disadvantage. The less abrasion fines deposited in the grooves (28), the lower is the risk of parasitic currents developing between the bars (27).

(Figure 2)



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Fig. 1

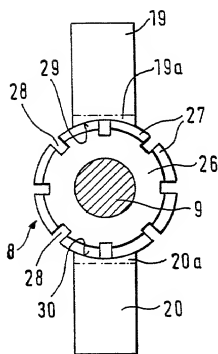
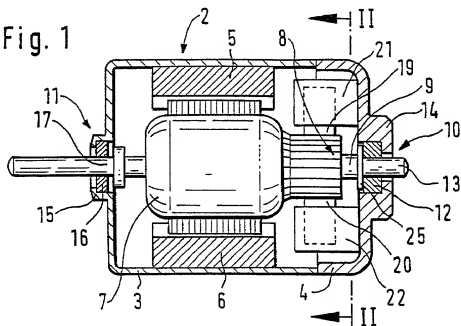


Fig. 2

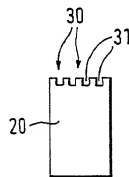


Fig. 3

**COMBINED DECLARATION AND  
POWER OF ATTORNEY FOR PATENT APPLICATION**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below adjacent to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled "**ELECTRIC MACHINE HAVING A COMMUTATOR**", and the specification of which:

- ☐ is attached hereto;
- ☐ was filed as United States Application Serial No. \_\_\_\_\_ on \_\_\_\_\_, 19\_\_ and was amended by the Preliminary Amendment filed on \_\_\_\_\_, 19\_\_.
- ☒ was filed as PCT International Application Number PCT/DE99/01206, on the 22<sup>nd</sup> day of April, 1999.
- ☒ an English translation of which is filed herewith.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a). I hereby claim foreign priority benefits under Title 35, United States Code § 119 of any foreign application(s) for patent or inventor's certificate or of any PCT international applications(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

EM360463383 US

**PRIOR FOREIGN/PCT APPLICATION(S)  
AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119**

Country : Germany

Application No. : 198 18 113.2

Date of Filing: April 23, 1998

Priority Claimed

Under 35 U.S.C. § 119 : ☒ Yes    ☐ No

I hereby claim the benefit under Title 35, United States Code § 120 of any United States Application or PCT International Application designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations § 1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

**PRIOR U.S. APPLICATIONS OR  
PCT INTERNATIONAL APPLICATIONS  
DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. § 120**

**U.S. APPLICATIONS**

Number :

Filing Date :

**PCT APPLICATIONS  
DESIGNATING THE U.S.**

PCT Number :

PCT Filing Date :

I hereby appoint the following attorney(s) and/or agents to prosecute the above-identified application and transact all business in the Patent and Trademark Office connected therewith.

(List name(s) and registration number(s)):

Richard L. Mayer,  
Gerard A. Messina,

Reg. No. 22,490

Reg. No. ~~35,952~~

Reg. No. \_\_\_\_\_

Reg. No. \_\_\_\_\_

2

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New York, New York 10004

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Facsimile No.: (212) 425-5288

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Full name of inventor 1-07  
Dieter SCHULER

Inventor's signature Dieter Schuler Date 22.11.99

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Federal Republic of Germany

Post Office Address Same as above

*Wolfgang Wittenberg*

Full name of inventor

2-00  
Christoph EITEL

Inventor's signature

Christoph Eitel

Date

30.11.99

Citizenship

Federal Republic of Germany

Residence

Antoniusstr. 16

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Federal Republic of Germany

*Tackyoung Kim*  
*7/2/00 09/11/99*

Post Office Address

Same as above

Full name of inventor Gerald KUNZEL

Inventor's signature Gerald Kunzel Date 23. November 1993

Citizenship Federal Republic of Germany

Residence Oberhofstr. 6a  
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Federal Republic of Germany

Post Office Address Same as above

08244121

VERBODEN TOEGANG 4-07

Full name of inventor Andreas EWERT

Inventor's signature *Andreas Ewert* Date 23.11.99

Citizenship German

Residence Wörthstr. 3  
D-77839 Lichtenau DE  
Federal Republic of Germany

Post Office Address Same as above

*Wolfgang Lichtenau*

08244121